

HOW TO PROCURE DYNAMIC LIGHTING PROJECTS

A PRACTICAL GUIDELINE

Deliverable D.T4.2.3: “Strategy to facilitate the integration of dynamic lighting from a legal perspective”

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Dynamic Light - The project in brief

Public lighting is responsible for approximately 6% of global CO₂ emissions. The Dynamic Light project aims to lessen this environmental impact by improving the energy efficiency of public lighting. Although many conventional lighting fixtures can be made more energy-efficient, public authorities often lack a strategic approach to convert existing lighting infrastructure. Dynamic lighting maximises energy efficiency through 1) state-of-the-art technology in luminaires and 2) the use of dimming and adaptive control systems. Barriers to its implementation include the absence of a legal framework for dynamic dimming and higher initial costs relative to those of standard LED lights. Municipalities generally hesitate to invest in dynamic lighting for these reasons. Nevertheless, growing concern about light pollution and the need to improve public lighting has prompted greater interest in dynamic lighting due to its potential to both increase energy efficiency and raise the quality of stay in urban areas.

The main objective of the Dynamic Light project is to improve light and energy management and facilitate a transition from municipally planned light infrastructure towards a modern, energy-efficient, and demand-oriented lighting design. This process will require a harmonisation of public lighting standards and norms to better accommodate social needs and enable greater use of dynamic lighting. The Dynamic Light project will introduce the steps required to translate urban dynamic lighting strategies into action, from the idea to the analysis, geographic information system (GIS) data mining, strategy development, financial modelling, procurement procedure, implementation, and evaluation. Pilot actions in municipalities throughout Europe will demonstrate the benefits of dynamic lighting through a joint implementation and testing process and will bolster acceptance of energy-efficient lighting among end users and urban planners.

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Acronyms and abbreviations

AECI	Annual energy consumption indicator
AT	Austria
CF	Cohesion Fund
CCT	Correlated colour temperature
cd/klm	Candela per kilolumen
CPV	Common procurement vocabulary
CZ	Czech Republic
DE	Germany
EBRD	European Bank for Reconstruction and Development
EC	European Commission
eeef	European Energy Efficiency Fund
EEOS	Energy Efficiency Obligation Scheme
EFSI	European Fund for Strategic Investments
EIAH	European Investment Advisory Hub
EIB	European Investment Bank
ELENA	European Local Energy Assistance
EMAS	Engineered materials arresting system
EPC	Energy performance contracting
ERDF	European Regional Development Fund
ESCO	Energy service company
ESIF	European Structural and Investment Funds
ESPD	European Single Procurement Document
EU	European Union
FZOEU	Environmental Protection and Energy Efficiency Fund (Croatia)
GDP	Gross domestic product
GGF	Green for Growth Fund
GIS	Geographic information system



GPP	Green Public Procurement
HR	Hungary
IKK	Investitionskredit Kommunen
IKU	Investitionskredit Kommunale und Soziale Unternehmen
IT	Italy
JASPERS	Joint Assistance to Support Projects in European Regions
K	Kelvin
KfW	Reconstruction Credit Institute
Lm/W	Lumens per watt
LCC	Life-cycle costing
MEAT	Most economically advantageous tender
NKI	National Climate Initiative
OJEU	Official Journal of the European Union
PA	Pilot action
PO	Poland
PP4EE	Private Finance for Energy Efficiency
R&D	Research and development
RULO	Ratio of upward light output
REEP	Regional Energy Efficiency Programme for the Western Balkans
SID Bank	Slovene Export and Development Bank
SL	Slovenia
SlovSEFF	Slovak Energy Efficiency and Renewable Energy Finance Facility
TWh	Terawatt hours
VAT	Value-added tax
VfM	Value for money



Executive Summary

Implementing and upgrading public lighting infrastructure is a challenging process for all stakeholders involved. Moreover, implementing new technologies in the public lighting infrastructure raises complex legal, technological, and financial questions. The successful conversion of conventional lighting infrastructure to dynamic lighting solutions will require knowledge transfer and capacity-building among decision-makers and practitioners. This report aims to address existing barriers to this transition process by providing a guideline to the implementation of public dynamic lighting infrastructure. It focuses on the experience of municipalities in Central European countries (namely Austria, Croatia, the Czech Republic, Germany, Italy, Poland, and Slovenia) that have installed public lighting infrastructure on a pilot basis as part of the Dynamic Light project. These pilot actions were financed through INTERREG Central Europe.

Given the complexity of the public procurement process, a lack of capacities and knowledge regarding such process among decision-makers and practitioners is commonly cited as a significant barrier for promoting dynamic, intelligent, and energy-efficient public lighting. Especially the rules for (green) public procurement¹ are complex. Unlike private actors, public authorities may not freely choose their contract partners. This guideline tackles this barrier by providing a guideline for implementing public dynamic lighting infrastructure. It focuses on countries of Central Europe, namely Austria, Croatia, the Czech Republic, Germany, Italy, Poland, and Slovenia, and refers to the experience of municipalities involved in the Dynamic Light project that implemented public lighting infrastructure, in pilot basis, financed by INTERREG Central Europe.

This guideline is primarily intended for public-sector decision-makers who are responsible for local public lighting infrastructure, namely municipal lighting departments, procurement officers, urban planners, and public service providers. Its contents are also relevant for other stakeholders involved in public lighting planning and implementation, including lighting designers, architects and urban planners, advisory engineers, players in the lighting industry, and civil society organisations (e.g. NGOs) and local citizens.

The main sources of information for elaborating the guideline were two previous reports elaborated within the Working Package 4 of the Dynamic Light project, namely: *Comparative inventory* (D.T4.2.1) and *Analysis of the political and legal framework and the examples* (D.T4.2.2). Moreover, the main contents and approach of the guideline were discussed with experts in the field during the *Information events* (D.T4.2.4) held back-to-back with the *Transnational multiplier training seminars* (D.T2.4.2) in three different locations, namely: Cesena, Berlin, and Pilsen, in November 2018. During the Information events, workshops were organized with in order to collect participants opinions on the contents of the guideline. The valuable feedback received was collected, analyzed, and integrated in this document.

The implementation of dynamic lighting projects presents stakeholders with complicated technical and legal challenges. Smaller municipalities, in particular, may lack the necessary human-resource capacity and expertise in these fields. The rules for (green) public procurement² are especially complex. Unlike private actors, public authorities must choose contract partners in accordance with set parameters. To prevent corruption and guarantee equal access of economic actors to public contracts, contracting by public authorities is governed by provisions of public procurement law. In EU countries, this legal field is complicated by the fact that it is primarily guided by provisions of EU law that are transposed by Member

¹ In the following, the general term “public procurement” is used as an overarching concept for both public procurement and concessions contracts. For the distinction between public procurement in a stricter sense and concessions contract, see below under “Nature of the contract: public procurement or concession?”.

² In the following, the general term “public procurement” is used as an overarching concept for both public procurement and concession contracts. For the distinction between a concession contract and public procurement in a stricter sense, see below under “Nature of the contract: public procurement or concession?”.



States into their respective national law. Relevant provisions therefore involve both EU directives and national laws.³

This document introduces relevant stakeholders to necessary project steps to implementation, as well as to legal challenges that may arise in the development of a dynamic lighting concept. It also provides practical recommendations for effective project implementation.

The implementation of a dynamic lighting project is a process involving many steps. The following subsections summarise the most important activities at each stage, from project conception to completion.

Where to start

A municipality interested in implementing a dynamic lighting solution must first assess its concrete needs and the goals that the municipality aims to achieve. In general, municipalities participating in the Dynamic Light project implemented such solutions to reduce energy consumption in public lighting infrastructure and thus lower their CO₂ emissions. Nonetheless, dynamic lighting can provide other advantages as well. These include environmental benefits, such as the reduction of light pollution and negative effects on urban wildlife; social benefits, such as an improved quality of life from higher security standards and better urban aesthetics at night; and economic benefits, such as those due to a significant reduction in municipal energy costs.

Designing a project

Designing a dynamic lighting project constitutes an intervention in the public space. As a result, many aspects should be considered in addition to the technological requirements of public lighting. Important factors include the social needs of end users or beneficiaries, the environmental impact of the intervention, and the legal and regulatory frameworks that affect urban planning. Moreover, due to the innovative nature of dynamic lighting solutions, the municipalities seeking to implement such projects may lack the necessary human resources. Based on the experience of municipalities that have implemented such solutions on a pilot basis within the Dynamic Light project, it is advisable to develop synergies with private developers working in the field.

Financing a project

Implementing a dynamic lighting project may require municipalities to pay considerable investment costs. Within the Dynamic Light project, different funding sources for energy-efficient street lighting in Central Europe were identified. The most relevant are 1) European funding sources, such as the European Structural and Investment Funds (ESIF), European Regional Development Fund (ERDF), and Cohesion Fund (CF); 2) national funding sources, which are available to each Member State that operates and co-finances multiple supporting programmes based on ESIF funding; 3) financial intermediaries, which play a crucial role in providing finance for energy-efficiency investments; and 4) the private sector, which plays an active role in the energy sector and could therefore finance or co-finance the implementation of a dynamic lighting solution.

Procuring a contract

Municipalities in the EU must follow a very strict set of public procurement rules. Therefore, municipalities interested in implementing such projects will likely encounter the greatest challenges in the procurement stage. The EU has established a general framework on public contracts for its Member States. This framework provides a common legal basis for countries and municipalities within the EU.

³ For a description of the relevant legal framework, see *Analysis of the political and legal framework and the examples* (D.T4.2.2).



Disclaimer

This document is intended to provide general information on the legal issues discussed therein. It should not be relied upon as a substitute for the advice of a qualified legal professional on specific legal questions. In particular, it is not intended to address concrete legal issues related to commercial decisions. Opinions expressed in this document reflect the current judgement of the authors but do not necessarily represent the official positions or policies of the authorities or courts involved in making decisions on related legal questions. Finally, certain links provided in this document connect to internet websites maintained by third parties over whom the authors have no control. The authors make no representations as to the accuracy or any other aspect of information contained in internet websites.



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1. Introduction

Cities account for more than 70% of global CO₂ emissions and over two thirds of the world's energy consumption.⁴ As a result, efforts to reduce emissions often target energy usage in urban areas. Public street lighting infrastructure accounts for a significant share of urban energy consumption in Europe, where more than 56 million street lighting luminaires use an estimated 35 TWh of electricity.⁵

The amount of electricity required to power public street lighting systems depends significantly on the specific technologies used. In municipalities with older, inefficient systems, street lighting can account for 30-50% of total electricity consumption and disrupt the environment through light pollution or other negative effects. The energy-saving potential of updated infrastructure is enormous: state-of-the-art technologies typically reduce energy use by 30-70%.⁶

Incorporating dynamic lighting solutions into public lighting infrastructure can support EU municipalities in achieving energy savings potentials and emission reductions targets. In addition to these benefits, the implementation of dynamic lighting can improve the quality of urban lighting infrastructure and reduce capital expenditures by lowering municipal energy costs. Moreover, the customised design of dynamic light solutions can accommodate specific social needs and thus improve the quality of life of citizens.

What is dynamic lighting?

During the project, the following definition was elaborated by the project partners:

“Dynamic lighting is adaptive lighting, i.e. it is being provided where and when it is needed depending on different variable conditions, such as travelling speed, traffic volume, and/or composition, ambient luminance, weather, and other exterior factors in a way that it reduces light pollution as well as energy consumption; beyond that it recognises varying human and social needs, such as aesthetics or feeling of safety, as a basic concern and key factor in the design of adaptive public lighting.”⁷

The Dynamic Light project has implemented a wide variety of pilot actions in municipalities within partner countries. The process of implementing dynamic lighting solutions has provided valuable practical experience for municipal staff, infrastructure and service providers, and energy agencies. Municipalities selected the pilot actions after analysing various opportunities for municipal public lighting infrastructure.

Pilot installations within the project range from pedestrian lighting in public parks, as in Cesena and Mantova (Italy), to lighting for public buildings and heritage sites, as in Sušice (Czech Republic). Pilot installations have also introduced new lighting solutions on city-centre streets, as in Čakovec (Croatia), or modelled a small-scale dynamic lighting solution, as in the city of Rostock (Germany). Moreover, because the Dynamic Light project also depends on research and innovation, other pilot installations have been designed to test technology in public lighting infrastructure. For example, a pilot installation planned for the city of Glienicke/Nordbahn (Germany) will study the effects of various scenarios of adaptive street lighting in the presence of cars, cyclists, or pedestrians.

Table 1 below provides an overview of the pilot actions implemented in the project.

⁴ Source: C40 Cities network, <https://www.c40.org/>.

⁵ Source: Streetlight-EPC project, <http://www.streetlight-epc.eu/the-project/>.

⁶ Ibid.

⁷ Source: Deliverable D.T4.2.1 - Comparative inventory.



Pilot action designation	Country	City	Aim
PA1	IT	Mantova	Improving public lighting in a green area in Mantova
PA2	HR	Čakovec	Introducing new lighting solutions on city-centre streets
PA3	DE	Glienicke/Nordbahn	Upgrading existing street lighting infrastructure
PA4	CZ	Sušice	Upgrading the lighting of a heritage site in the town
PA5	IT	Cesena	Updating public lighting in a park area
PA6	SL	Gorenjska region	Installing dynamic lighting in small municipalities
PA7	DE	City of Rostock	Demonstrating a small-scale dynamic lighting solution
PA8	PO	Poland	Demonstrating a small-scale dynamic lighting solution
PA9	AT	Guessing Castle	Upgrading the lighting of a heritage site in the town

Table 1. Dynamic Light project pilot actions.

Source: Interreg.⁸

The number of system components, as well as their technical specifications, varies from project to project based on the complexity of each dynamic lighting solution. In general, a lighting system consists of two main components: 1) the public lighting network and 2) a dynamic monitoring and control system.

Various technological innovations were made in the system components of each pilot action in the Dynamic Light project. For example, the main innovations made to the park lighting system in the Mantova pilot installation are shown in the box below.

Technical description of the installation in Mantova

The Mantova pilot installation implemented a smart network integrating four systems, namely:

- 1) one new public lighting system that is energy-efficient (through LED technology) and intelligent (able to detect human presence);
- 2) one Wi-Fi network;
- 3) one video surveillance system;
- 4) two interactive information panels (one at the beginning and one at the end of the fitness trail).

⁸ INTERREG Central Europe, Dynamic Light project, "Pilot installations", available at: <https://www.interreg-central.eu/Content.Node/Dynamic-Light/Pilot-Actions.html> (accessed 14 January 2019).



2. Implementing a dynamic lighting project: where to start?

The implementation of a dynamic lighting solution involves many steps, from the conception of the project through the end of the contract period. A municipality must first assess its concrete needs, then develop a concept of its own as needed and find a suitable financing and contractual partner if the available financial or human resources fall short of those required for project implementation (figure 1).

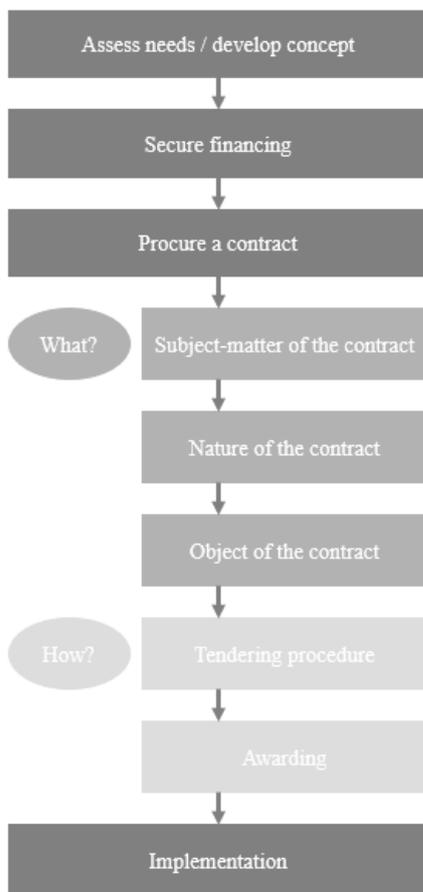


Figure 1. Milestones in a dynamic lighting concept.

Source: Authors' own elaboration.

How to address the identified needs with dynamic lighting solutions and how to develop a concept

Dynamic lighting solutions can be very beneficial for municipalities. The project pilot actions have shown that municipalities in the EU have specific needs that can be met through the implementation of dynamic lighting solutions. In general, one of the most relevant needs is to reduce the energy used in public lighting infrastructure and thus decrease CO₂ emissions. This would allow municipalities to implement climate action plans and meet climate targets as well as to achieve additional environmental or nature-conservation goals, such as a reduction in urban light pollution. The implementation of appropriate technologies and systems for reducing light intensity can also be designed to accommodate the needs of specific public spaces, such as variable usage over time (e.g. in early morning hours, a minimum intensity is needed due to security issues). Finally, dynamic lighting solutions can increase energy-efficiency in public lighting designed to enhance the aesthetics of public buildings.



Once concrete needs are identified, a project concept can be elaborated. The European Commission (EC) publishes best-practice examples, such as the Green Public Procurement (GPP) criteria for street lighting and traffic signals,⁹ that are useful in project design and can inspire future project developers and contracting authorities. For concrete implementation of the concept, an external (private) actor must also **secure the necessary financing and tender the relevant contractual relationships** in accordance with applicable public procurement rules. Furthermore, the contracting authority must ensure that it has the **competence** to modify or upgrade the infrastructure; ownership issues, for example, might make it necessary for the contracting authority to purchase ownership of infrastructure elements belonging to third parties.

Assess the state of the existing infrastructure

The development of a dynamic lighting project may require upgrading the technology of the luminaires or even redesigning the entire lighting infrastructure. The **condition of the existing infrastructure** (e.g. number and state of the luminaires, the technology used) must be assessed¹⁰ to allow for a more accurate projection of the materials, services, and investment costs required for project implementation.

Finance a project

The implementation of a dynamic lighting project may be associated with **high investment costs** that are ultimately borne by the municipality. Different financing models are presented below in the section “Financing a project”.

Assess the necessary human resources

The human resource requirement is particularly relevant because, in most cases, public actors will be unable to develop an ambitious project using only internal resources. Where external support is necessary, part or all the components of the project’s implementation will be **entrusted to a third party, usually an economic operator**. The contractual relationship between the public authority and the economic operator will be governed by a contract following a tendering procedure.

⁹ European Commission, “GPP Good Practice”, 19 November 2018, http://ec.europa.eu/environment/gpp/case_group_en.htm (last accessed 17 December 2018).

¹⁰ This practice is recommended in Italy, for example, by the Ministerial decree of 28 March 2018 on “Minimum environmental criteria for public illumination services” in GU Serie Generale n.98 of 28-04-2018 and by the new “EU green public procurement criteria for road lighting and traffic signals”, available at: http://ec.europa.eu/environment/gpp/pdf/toolkit/181210_EU_GPP_criteria_road_lighting.pdf (accessed 10 January 2019).



3. Project design

The project design for Dynamic Light involves an intervention in public space. In addition to technical considerations related to public lighting, it is necessary to consider the **social needs of the end users or beneficiaries**, the **environmental impacts of the intervention**, and the **legal and regulatory frameworks related to urban planning**. The latter emphasises the need to assess in detail the compliance of the intervention with relevant provisions of the current legal framework, such as those affecting public lighting standards, transportation and street infrastructure, land-use planning, and security. The innovative nature of dynamic lighting solutions, which respond to the need for energy-efficient alternatives, represents an appreciable added value compared to a simple upgrade of luminaires in public space. Depending on the existing internal capacities in a given municipality, an external entity may be hired to design the project.

Based on the experience gained from pilot actions, project design is a joint effort between the **municipality**, in its role as the public authority, and the **private developer**, who generally provides the required experience and technical capacities. The project concept could emerge either from the municipality or the private developer. Based on the pilot actions implemented within the Dynamic Light project, the **private developers are often the project initiators**. In the pilot action in the city of Mantova (Italy), for example, TEA Reteluce, a TEA Group subsidiary subject to TEA S.p.A., redeveloped the public lighting network to optimise energy usage, conserve energy, protect the environment, and upgrade all lighting points in the pilot action.¹¹

Moreover, because every Dynamic Lighting project primarily addresses public lighting infrastructure, **private companies innovating in the field** are potential project initiators; they could present any municipality with a proposal to innovate local public lighting technology through a dynamic lighting intervention in public space.

Regardless of the source for dynamic lighting initiatives, however, the steps involved in project design and development are generally the same for any intervention in public lighting infrastructure. As an example, the design process for the pilot action in the city of Cesena consisted of the following six steps:

1. Analysis of the specific lighting situation of the intervention area;
2. Site-specific analysis;
3. Light network description;
4. Identification of specific social needs;
5. Analysis of the site legal framework;
6. Planning and development.¹²

The eventual contract relationship between the public authority and project developer depends on the project modalities. The contract concept – and subject-matter of the contract – determine the contract object, value, and duration, as well as the relationship between the parties. It also has a direct effect on the applicable public procurement rules.¹³

¹¹ For further information on the technical partners involved in the Pilot Action in the City of Mantova, see Deliverable D.T.3.1.4 - Planning of intelligent light concepts: Technical Partners Selection & Engagement Report.

¹² For further information, see Deliverable D.T.3.1.3 - Analysis of the specific lighting situation - CESENA.

¹³ See below under “Procuring a contract”.



4. Financing a project

Although upgrading street lighting would cut energy costs, many areas of Central Europe have not yet taken measures to improve their lighting infrastructure. **Budgetary constraints** on the owners – which are often municipalities – are commonly cited as a reason for this inaction. Among its various tasks, the Dynamic Light project examined the **financing of energy efficiency upgrades of street lighting infrastructure in municipalities across Central Europe**. Numerous potential funding sources were identified that could cover the costs of installing energy-efficient street lighting without depleting municipal resources, as presented in figure 2 below.¹⁴

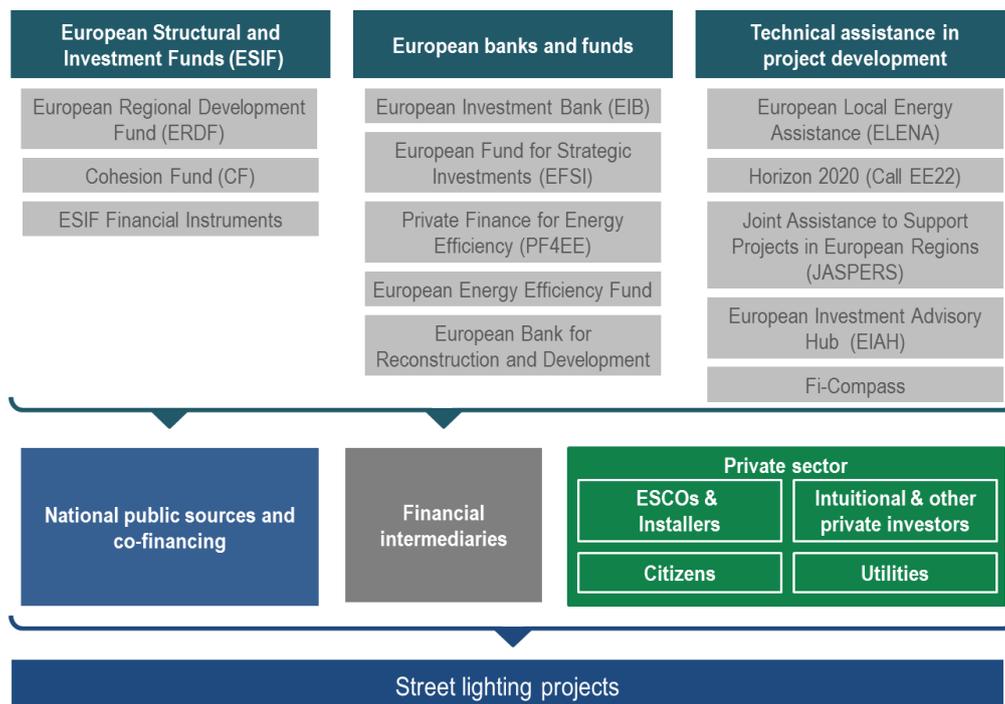


Figure 2. Funding sources for energy-efficient street lighting in Central Europe.

Source: Novikova et al. (2017), adapted from Covenant of Mayors for Climate & Energy (2016).

4.1 European funding sources

A number of **EU funds and intermediaries** can provide financing for the preparation and actual implementation of the project. For instance, the European Structural and Investment Funds (ESIF) channel their resources to the Member States through operational programmes designed by each country according to its policy priorities. Two ESIF funds, the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), cover multiple energy-efficiency measures, including street lighting. The European Investment Bank (EIB) manages and/or co-finances several funds and facilities, such as the European Fund for Strategic Investments (EFSI), Private Finance for Energy Efficiency (PP4EE) and the European Energy Efficiency Fund (eeef) which provide support for street lighting projects. The European Bank for Reconstruction and

¹⁴ The project’s Deliverable D.T2.3.2 “Analysis of funding sources” (Novikova, A., Stelmakh, K., Hessling, M., Emmrich, J., and Stamo, I. 2017. Guideline on finding a suitable financing model for public lighting investment: Deliverable D.T2.3.3 Best practice guide. Report of the EU funded project “INTERREG Central Europe CE452 Dynamic Light”, October 2017. URL: <http://www.interreg-central.eu/Content.Node/Dynamic-Light/CE452Dynamic-Light-D.T2.3.3-Best-Practice-Guide-final.pdf>) summarised the results of research into potential funding sources. Please consult the deliverable for the information on eligible measures, beneficiaries and conditions for each individual fund. The report also describes the application process for each of them, necessary links and contacts, examples of successful project and additional reading materials.



Development (EBRD) provides support through credit lines to local commercial banks, which ultimately disburse funds to municipal lighting projects in Croatia, Hungary, Poland, Slovakia, and Slovenia.

EU-funded technical assistance in project development is available through the European Local Energy Assistance (ELENA) programme, the Joint Assistance to Support Projects in European Regions (JASPERS) initiative, and Horizon 2020 Project Development Assistance (Call EE-22-2016-2017). In addition, the European Investment Advisory Hub (EIAH) and fi-compass advisory services offer practical support, including expertise and skills training.

4.2 National funding sources

Each Member State uses ESIF funding to operate and co-finance multiple support programmes. Many countries offer additional options for support from the national budget, including grants or low-interest rate loans, and channel assistance through national environmental funds, national development banks, or other intermediaries.

In some countries, such as Germany, **national public funding** far exceeds support from EU funds. Subnational governments often administer **regional support programmes**. The main programmes are listed in table 2 below.¹⁵

Country	Programmes
Austria ¹⁶	Der Klima- und Energiefonds (Climate and Energy Fund) Energiesparen in Gemeinden (Energy Savings in Local Communities) Energiesparen in Betrieben (Energy Savings in Industry and Commerce) Energie-Contracting-Programme of Upper Austria
Croatia	Regional Energy Efficiency Programme for the Western Balkans (REEP) Green for Growth Fund Southeast Europe (GGF) Environmental Protection and Energy Efficiency Fund (FZOEU)
Czech Republic	National Environmental Programme implemented by the Ministry of the Environment Programme with support from the State Environmental Fund Programme EFEKT of the Ministry of Industry and Trade
Germany	Programmes of the Kreditanstalt für Wiederaufbau (KfW) ¹⁷ National Climate Initiative (NKI), implemented by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
Hungary	The European Bank for Reconstruction and Development (EBRD) and the International Finance Corporation (IFC) provide credit lines through local financial institutions.
Italy	Under the White Certificate scheme, electricity generators and distributors are required to implement energy efficiency measures for eligible street lighting.

¹⁵ For further detail on the programmes (including application conditions, relevant links, and contacts), see Deliverable D.T2.3.2 “Analysis of funding sources”.

¹⁶ Regional programmes to support energy savings exist in all regions of Austria; for comprehensive programme descriptions (including application criteria, conditions, and contacts), see the publication ‘Support for environmental and energy consulting: examples of successful joint federal/regional consulting programmes’ [*Förderungen für Umwelt-und Energieberatungen: Erfolgsbeispiele aus den gemeinsamen Beratungsprogrammen von Bund und Ländern*].

¹⁷ Municipalities or municipal enterprises can receive funding for street lighting through two main programmes, IKK [Investitionskredit Kommunen (208)] and IKU [Investitionskredit Kommunale und Soziale Unternehmen (148)].



Poland	National Fund for Environmental Protection and Water Management - programme 'Intelligent energy networks (smart grid)'
Slovakia	Municipalities can apply to SlovSEFF for funding with ESCOs that are willing to develop street lighting projects and upgrade energy efficiency in cities and towns.
Slovenia	Slovenian Environmental Public Fund (Eco Fund) Energy Efficiency Obligation Scheme (EEOS) Slovene Export and Development Bank (SID Bank)

Table 2. National and local financing programmes.

Source: Authors' own elaboration based on Novikova et al. (2017).

Municipalities can establish a **revolving fund** to multiply available capital. Figure 3 illustrates a revolving fund organised for energy-efficiency projects. A municipality invests capital (e.g. equity or debt) into a project (e.g. a street lighting upgrade). The project saves energy, which translates into energy cost savings that free up some of the budget resources previously used to cover utility bills. These funds, in turn, can be used to repay the initial investment and/or reinvest in new projects, thus creating a revolving model.

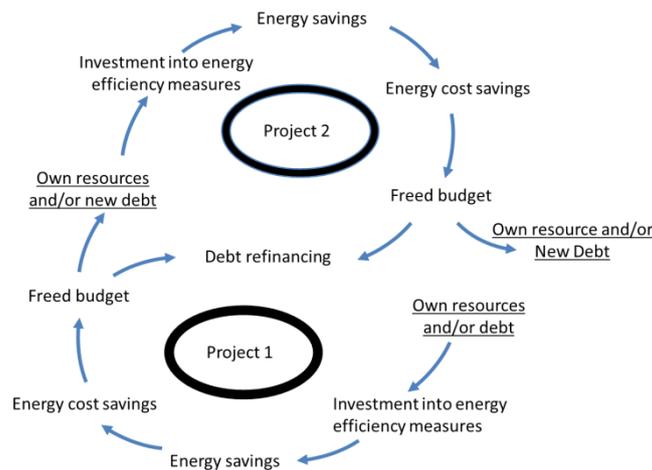


Figure 3. Capital flow in a revolving fund.

Source: Novikova et al. 2017.

4.3 Financing by a private contractor

Municipal actors can also **reallocate to third parties the burden of financing street lighting infrastructure**. For instance, financing can be covered by a private partner, which delivers the upgrade works, is generally not responsible for the energy supply, and therefore cannot use energy savings to cover its own financing needs. The private partner finances the street lighting project from its own funds or obtains funds from third parties. The municipalities pay the contractor for its services. If the contractor obtains financing from additional third parties, it repays the debt to them. The municipal payment to the contractor and the contractor's payments to a lender are not contingent on energy savings.

Alternatively, financing can be provided by a private partner that delivers the upgrade works, makes payments on the basis of the energy savings achieved, and uses these payments to make the project investment. This model is referred to as **“energy performance contracting” (EPC)**, and the private actor is referred to an **“energy savings company” (ESCO)**. There are different forms and models of EPCs. The element common to all EPC models, however, is that cost savings achieved by reducing energy consumption are used to finance the investment.



In EPC models, the municipality or a private partner is responsible for the energy supply. In the end, however, it is always the municipality that pays for the services (including energy supply, planning, financing, and installing the new equipment), either separately or as a lump sum. In the model shown in figure 4, future municipal costs (consisting of energy costs plus regular payments to the private partner) are identical to municipal energy costs paid before the modernisation took place. When state-of-the-art LED luminaires with “intelligent” controls replace old lighting technology, such upgrades can deliver energy savings of up to 80% or more. In this case, municipalities can use a significant portion of the cost savings to cover EPC fees to the service provider. This arrangement can either shorten the length of the contract or reduce the municipality’s regular payments, allowing for immediate savings even during the contract term. One of the major benefits of such a financing model is that a municipality may transfer all of the risks related to implementation, design, and maintenance of new street lighting technologies to an ESCO and eventually benefit from its experience and capabilities.¹⁸

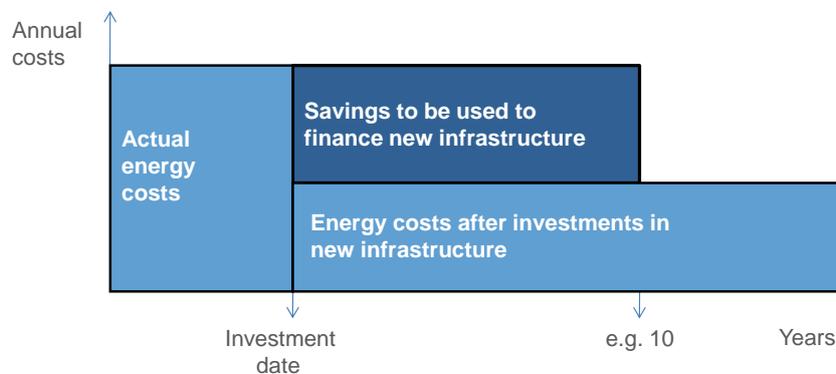


Figure 4. EPC guaranteed savings model.

Source: Novikova et al. 2017.

¹⁸ There are numerous case studies of ESCO models used for street lighting projects throughout Europe. For more details, see Deliverable D.T2.3.2 “Best practice guide” (Novikova, A., I. Stamo., Stelmakh, K., Hessling, M., 2017. Guideline on finding a suitable financing model for public lighting investment. Analysis of funding sources. Deliverable D.T2.3.2 of the Dynamic Light project of INTERREG CE platform. URL: <http://www.interreg-central.eu/Content.Node/Dynamic-Light/Dynamic-Light-D.T2.3.2-Novikova-et-al.-2017-Financing-Model-.pdf>). The report provides an overview of each model, identifies the projects to which it could be applied, specifies its advantages and disadvantages, and includes a relevant case study.



5. Procuring a contract

Due to a lack of resources, public actors may seek external support for project implementation. Unlike private economic actors, which may choose a contract partner freely on the market, public bodies must comply with **public procurement rules**. These rules are intended to ensure transparency in public actors' choices of contractual partners and to avoid distortions of competition on a free market – an important consideration in light of the size of the public procurement market (15-20% of global GDP with an estimated volume of €1.3 trillion).¹⁹

Under public procurement rules, public actors are generally required to perform a **tendering procedure** to procure a contract. After the tender process, the public actor enters into a contract with the successful bidder. The provisions governing public procurement procedures are set by a complex set of rules at EU and national levels. A general EU framework has established a common legal basis for public contracts in Member States: the directive on public procurement²⁰ (hereinafter “PP Directive”) and the directive on the award of concession contracts²¹ (hereinafter “Concessions Directive”). Because these directives are transposed by national legislatures into the legal orders of the respective Member States, however, the specific design of public procurement rules may vary between EU countries.

Applicable public procurement rules

It would exceed the scope of this report to elaborate on the national public procurement rules of all countries represented in the Dynamic Light project. This document instead addresses the European framework for public procurement as a common reference. It is essential for contracting authorities to review applicable national public procurement rules to identify any discrepancies with the European framework.

Tendering is a complex process consisting in several steps that go throughout the procurement procedure and project life. Typical procedure stages for public procurements are shown in figure 5 below.

¹⁹ European Commission, DG GROW, “Public procurement”, available at: https://ec.europa.eu/growth/single-market/public-procurement_en (accessed 18 December 2018).

²⁰ Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, *OJ L 94*, 28.3.2014, p. 65-242.

²¹ Directive 2014/23/EU of the European Parliament and of the Council of 26 February 2014 on the award of concession contracts, *OJ L 94*, 28.3.2014, p. 1-64.



1. Preparation and planning	2. Publication and transparency	3. Submission of tenders, opening and selection	4. Evaluation and award	5. Contract implementation
<ul style="list-style-type: none"> » Detect future need » Engage stakeholders » Analyse market » Define the subject matter » Choose the procedure 	<ul style="list-style-type: none"> » Draft specifications including criteria » Prepare procurement documents » Advertise the contract » Provide clarifications 	<ul style="list-style-type: none"> » Receipt and opening » Apply exclusion grounds » Select suitable tenderers 	<ul style="list-style-type: none"> » Evaluate tenders » Award and sign the contract » Notify tenders and publish the award 	<ul style="list-style-type: none"> » Manage and monitor the execution » Issue payments » If needed, deal with modification or termination of contract » Close the contract

Figure 5. Typical stages of the public procurement procedure.

Source: European Commission (2018).²²

Who must tender?

Both the PP Directive and Concessions Directive apply to procurement by “contracting authorities”.²³ Therefore, all contracting authorities must comply by public procurement rules.

Contracting authorities are defined as “the State, regional or local authorities, bodies governed by public law or associations formed by one or more such authorities or one or more such bodies governed by public law”.²⁴

Bodies governed by public law are defined as “bodies that have all of the following characteristics:

- (a) they are established for the specific purpose of meeting needs in the general interest, not having an industrial or commercial character;
- (b) they have legal personality; and
- (c) they are financed, for the most part, by the State, regional or local authorities, or by other bodies governed by public law; or are subject to management supervision by those authorities or bodies; or have an administrative, managerial or supervisory board, more than half of whose members are appointed by the State, regional or local authorities, or by other bodies governed by public law”.²⁵

Entities that fall under these definitions must therefore issue tenders when necessary. In some cases, it may be unnecessary for a contracting authority to initiate a tendering procedure.

²² European Commission (2018), *Public procurement guidance for practitioners on avoiding the most common errors in projects funded by the European Structural and Investment Funds*, available at https://ec.europa.eu/regional_policy/sources/docgener/guides/public_procurement/2018/guidance_public_procurement_2_018_en.pdf (accessed 17 December 2018).

²³ The Concessions Directive also refers to “contracting entities”, these are however only relevant for the award of concessions in the energy, postal, or transport sector, which is not relevant to this report.

²⁴ Art. 2 par. 1 (1) PP Directive; Art. 6 par. 1 Concessions Directive.

²⁵ Art. 2 par. 1 (1) PP Directive; Art. 6 par. 4 Concessions Directive.



When is tendering unnecessary?

Public bodies are not always required to tender their contracts. Tendering procedures are not required when one of the following conditions is met:

1) When the contract is procured in-house

This refers to contracts **between entities that are part of the same administrative apparatus**. In this scenario, the contracting authority exerts such a strong influence on the other party that it cannot be considered external to the awarding administration. Under these circumstances, the contract can be **awarded directly**. The contracting partner can be a legal person governed by private or public law, provided that all conditions for in-house procurement are fulfilled. Under EU directives,²⁶ this is the case when:

- a) *the contracting authority exercises over the legal person concerned a control which is similar to that which it exercises over its own departments;*
- b) *more than 80% of the activities of the controlled legal person are carried out in the performance of tasks entrusted to it by the controlling contracting authority or by other legal persons controlled by that contracting authority; and*
- c) *there is no direct private capital participation in the controlled legal person with the exception of non-controlling and non-blocking forms of private capital participation required by national legislative provisions, in conformity with the Treaties, which do not exert a decisive influence on the controlled legal person.*

2) When the contract is non-pecuniary

A “*contract for pecuniary interest*” is a contract under which the parties agree to provide one service in exchange for another. The object of the exchange does not necessarily involve a payment; it can also consist in advantages of another nature provided by the contracting authority. In the absence of any kind of remuneration for the services rendered, the contract falls outside the scope of public procurement rules.

3) When the monetary value of the contract is below the relevant procurement threshold

If the estimated monetary value of a contract falls below the applicable threshold,²⁷ the contracting authority may award the contract directly. Under these circumstances, the thresholds set in EU directives represent minimum standards; the Member States are free to impose **lower thresholds** on contracting authorities. Therefore, it is important to **verify the thresholds set in national provisions**.

What rules must be observed?

Even when a tendering procedure is unnecessary, basic rules for fair competition must be observed. Compliance with principles of transparency and non-discrimination is always required.²⁸ This means, for example, that public authorities may not discriminate against businesses based on nationality; refer to specific brands, trademarks, or patents; or refuse to accept documents issued by other EU Member States if they provide the same level of guarantee.

²⁶ Art. 12 PP Directive; Art. 17 Concessions Directive.

²⁷ For general information about thresholds, see below under “Find the relevant threshold and tendering procedure”.

²⁸ European Commission (2018), “Tendering rules and procedures”, available at: https://europa.eu/youreurope/business/selling-in-eu/public-contracts/rules-procedures/index_en.htm (accessed 09 January 2019).



How to tender

A contract can be procured by a public authority under **various procedures**. In order to identify the appropriate procedure, the contracting authority must assess several elements that differ in accordance with the subject-matter of the contract. The **nature and object of the contract** determine the relevant threshold for procurement as well as the applicable procedure. The content of the tender and the criteria for awarding the tender are also conditional on the project concept. The applicable tendering procedure for public procurements is set by national law, regardless of whether the monetary value of the tendered contract lies above or below²⁹ the thresholds specified in the PP Directive. For tendering contracts whose value falls below the thresholds of the EU Directives, national law may prescribe specific procedures. In Italy, for example, a set of rules were issued for the procurement of contracts valued below the thresholds of the EU Directives; however, a direct award is possible for contracts whose value does not exceed €40,000.00.³⁰ Contracting authorities must therefore verify the relevant provisions set by national law.

For concessions, the contracting authority is free to choose the tendering structure, provided that it complies with the general rules concerning selection and award criteria and procedural guarantees.³¹ Concessions require greater flexibility due to the complexity, high value, and duration of these contracts.³²

Table 3 below provides a general overview of the various procurement procedures prescribed by the PP Directive.³³

Procedure	Description
Open procedure	Any interested economic operator may submit a tender without prior selection.
Restricted procedure	Any interested economic operator may submit a request to participate in the call. After a qualitative selection of at least five candidates, only pre-selected participants are permitted to submit a tender.
Competitive procedure with negotiation	Any interested economic operator may submit a request to participate in the call. After a qualitative selection of at least three candidates, only pre-selected participants are permitted to submit a tender, which will be the basis for subsequent negotiations. During the negotiations, the candidates may submit revised tenders, which are assessed in the final phase.
Competitive dialogue	Any interested economic operator may submit a request to participate in the call. After a qualitative selection of at least three candidates, the contracting authority enters into a dialogue with each pre-selected participant to identify its needs and determine the means best suited to satisfying them. Once solutions are identified, the candidates submit final tenders, which are assessed in the final phase.

²⁹ Art. 26 par. 1 PP Directive.

³⁰ Art. 36 D. lgs. 50, 2016, G.U. n. 91 of 19 April 2016. The thresholds for direct awards were provisionally increased by act n. 145 of 30 December 2018 (contracts valued at €40,000.00-€150,000.00€ can be awarded directly prior to consultation with at least three operators).

³¹ Art. 30 Concessions Directive.

³² Directive of the European Parliament and of the Council on the award of Concession Contracts - Frequently Asked Questions, available at: http://europa.eu/rapid/press-release_MEMO-14-19_en.htm?locale=en (accessed 07 December 2019).

³³ The different procedures are described in detail in Art. 27-32 of the PP Directive.



	This procedure is appropriate for tendering complex contracts, such as large infrastructure projects for which the contracting authority is unable to define technical specifications prior to the procedure. ³⁴
Innovation partnership	Any interested economic operator may submit a request to participate in a call. In the request, the contracting authority calls for an innovative product to meet a need that cannot be satisfied by products already available on the market. After a qualitative selection of at least three candidates, pre-selected participants are permitted to participate in the procedure. The contracting authority can then set up innovation partnerships with one or several partners.
Negotiated procedure without prior publication	The contracting authority invites a limited number of participants (at least three) to negotiate the terms of the future contract. This procedure may only be performed in specific cases, e.g. when no suitable tenders or requests to participate have been submitted in response to an open procedure or a restricted procedure; the contract object can be supplied only by a particular economic operator; or there is cause for extreme urgency.

Table 3. Procedures for tendering public procurements according to the PP Directive.

Source: Authors' own elaboration.

An exception to these rules is provided for research and development (R&D) services, which may be procured through a regular open procedure using **pre-commercial procurement**.³⁵ However, this exception does not apply for subsequent purchases of newly created products or services, which require a regular tendering procedure.

Publication duties

When the value of the tendered contract exceeds the thresholds specified in the directives, or when it has a potential cross-border interest,³⁶ it must also³⁷ be advertised in the *Supplement to the Official Journal of the European Union (OJEU)*.³⁸ Three types of notices may be published:

- the **prior information notice (PIN)**, in which the contracting authority announces its intention to initiate a procurement process;
- the **contract notice (CN)**, which contains the tendering documentation and launches the procedure, and;
- the **contract award notice (CAN)**, which publicises the decision of the contracting authority on the results of the procurement procedure.

³⁴ European Commission, "Tendering rules and procedures", last updated 13 November 2018, https://europa.eu/youreurope/business/selling-in-eu/public-contracts/rules-procedures/index_en.htm (accessed 11 January 2019).

³⁵ Recital 47 PP Directive.

³⁶ See n° 1.3 "Relevance to the Internal Market" of the Commission interpretative communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives, *OJ C 179, 1.8.2006, p. 2-7*.

³⁷ The notices may also be advertised in other international, national or local official journal, but never before the publication in the *OJEU*. For further information see OECD/SIGMA (2016), *Public procurement Brief 6, Advertising*, available at: <http://www.sigmaweb.org/publications/Public-Procurement-Policy-Brief-6-200117.pdf> (accessed 8 January 2019).

³⁸ The supplement of the European Official Journal is also electronically accessible as a free online version called "Tenders Electronic Daily (TED)", available at: <https://ted.europa.eu/TED/main/HomePage.do> (accessed 8 January 2019).



Only the contract notice and contract award notice must be published.³⁹ The European legal framework provides standard forms for these publications⁴⁰; they may be published in any of the languages of the EU, and a summary of the important elements of the notices must be published in the other official languages of the institutions of the Union.⁴¹ For concessions, the Concessions Directive requires⁴² the publication of a concession notice and concession award notice⁴³ not later than 48 days after the concession is awarded. Annex V of the PP Directive and annex V of the Concessions Directive set out a detailed list of the information to be included in the notices.

5.1 Nature of the contract: public procurement or concession?

Depending on the project's design, two types of contracts can be tendered: **public procurements** or **concessions**. These two contract types are mutually exclusive, i.e. a public procurement can never be a concession and vice versa.

The Concessions Directive defines concessions as contracts for pecuniary interest, "***the consideration for which consists either solely in the right to exploit the works that are the subject of the contract or in that right together with payment***".⁴⁴ The concessionaire obtains (most) of its remuneration from its right to commercial exploitation of the works or services rendered. **The operating risks** associated with the procured works or services are generally transferred to the concessionaire. Such risks include demand or supply risk or both.

How to assess whether the public contract transfers an operating risk

Under the Concessions Directive, a concessionaire is deemed to assume an operating risk if, "*under normal operating conditions, it is not guaranteed to recoup the investments made or the costs incurred in operating the works or the services which are the subject-matter of the concession*".⁴⁵ The transferred risk must involve "*real exposure to the vagaries of the market, such that any potential estimated loss incurred by the concessionaire shall not be merely nominal or negligible*".⁴⁶ In practical terms, the concessionaire is not guaranteed to recoup the investments made or the costs incurred in operating the works or the services which are the subject-matter of the concession.

³⁹ Art. 49 and art. 50 PP Directive.

⁴⁰ Commission Implementing Regulation (EU) 2015/1986 of 11 November 2015 establishing standard forms for the publication of notices in the field of public procurement and repealing Implementing Regulation (EU) No 842/2011, *OJ L 296, 12.11.2015*, p. 1-146. Standard forms are also provided by the European Union to facilitate practitioners in the official publication. European Commission, SIMAP, "Standard forms for public procurement", available at: <http://simap.ted.europa.eu/en/web/simap/standard-forms-for-public-procurement> (accessed 8 January 2019), and European Commission, DG GROW, "Innovation partnerships keep public services up to date", 3 March 2016, available at: https://ec.europa.eu/growth/content/8699-innovation-partnerships-keep-public-services-date_en (accessed 9 January 2019).

⁴¹ Art. 51 par. 3 PP Directive.

⁴² Art. 31 Concessions Directive.

⁴³ Art. 32 Concessions Directive.

⁴⁴ Art. 5 (1) Concessions Directive.

⁴⁵ Ibid.

⁴⁶ Ibid.



Concessions represent a **particularly attractive solution to implement dynamic lighting projects** because they mobilise private capital and know-how to supplement scarce public resources.⁴⁷ They are often described as “**public-private partnerships**” (PPP). However, a PPP is **not necessarily a concession**.

Public-private partnerships

PPPs are defined by the OECD as “*long-term contractual arrangements between the government and a private partner whereby the latter delivers and funds public services using a capital asset, sharing the associated risks*”.⁴⁸ The respective risks should be borne by the party best suited to manage them so that an optimal balance is obtained between risk-shifting and compensation for the risk-bearing party.⁴⁹ Depending on the share of risk borne by the contracting partner, the contract will be identified as a public procurement or as a concession. Due to the many different forms of PPP, there is no standard contract type for PPPs. The nature of the contract depends on the concrete design of the contract and the risk-sharing between the parties; as a result, the contractual nature must be evaluated on a case-by-case basis.

5.2 Object of the contract: works, supply of goods, or supply of services?

The threshold for a procurement procedure also depends on the **object of the contract**.⁵⁰ Therefore, accurately identifying the object of the contract is essential to ensure the legality of the tendering procedure. Among the variants relevant to dynamic lighting projects, three types of objects appear in the European public procurement directives: **works**, **supply of services**, and **supply of goods**. By definition, the object of a concession contract can be a work or supply of services, but never a supply of goods.

How to determine the object of the contract

Member States must comply with the following definitions, which are provided in the EU legal framework⁵¹:

Works means public contracts having as their object one of the following:

- the execution, or both the design and execution, of works related to one of the activities within the meaning of the Annexes of the directives, for example the general construction of buildings and civil engineering works, building installations, or building completions;
- the execution, or both the design and execution, of a work;
- the realisation, by whatever means, of a work corresponding to the requirements specified by the contracting authority exercising a decisive influence on the type or design of the work.

Supply of services means public contracts having as their object the provision of services other than those referred to in the *works* definition.

⁴⁷ European Commission, DG GROW, “Concession contracts - partnerships between the public sector and a private company” available at: http://ec.europa.eu/growth/single-market/public-procurement/rules-implementation/concessions_en (accessed 17 December 2018).

⁴⁸ OECD, “OECD Principles for Public Governance of Public-Private Partnerships”, <http://www.oecd.org/gov/budgeting/oecd-principles-for-public-governance-of-public-private-partnerships.htm> (accessed 20 December 2018).

⁴⁹ European Court of Auditors (2018), *Special Report | Public Private Partnerships in the EU: Widespread shortcomings and limited benefits*, available at https://www.eca.europa.eu/Lists/ECADocuments/SR18_09/SR_PPP_EN.pdf.

⁵⁰ See section below “From there: find threshold and relevant procedure”.

⁵¹ Art. 2 (4) PP Directive; art. 5 (1) Concessions Directive.



Supply of goods means public contracts having as their object the purchase, lease, rental or hire-purchase, with or without an option to buy, of products; a contract for the supply of goods “*may include, as an incidental matter, siting and installation operations*”.⁵²

How to determine the object of the contract

The contracting authority must use the definitions above to identify the object of each contract as works, supply of services, or supply of goods. In the **Annexes of the directives**, the EU provides a detailed, though not exhaustive, list of activities associated with contracts that must be considered works and tendered accordingly. Based on this EU guidance, the **installation of illumination and signalling systems for roads, railways, airports, and harbours** must be tendered as a works contract.⁵³

Contract types are mutually exclusive, i.e. the same activity cannot be deemed a work and a supply of services at the same time. In many cases, however, activities associated with different contract categories are required for project implementation. In such circumstances, a **mixed contract** must be procured.⁵⁴

5.3 Find the relevant threshold and tendering procedure

The nature and object of the contract determine the appropriate threshold and tendering procedure.⁵⁵ The contracting authority must refer to the threshold applicable to the relevant contract type. Under EU directives, the contract must be the object of a tendering procedure **if its estimated value (net of value-added tax (VAT)) is equal to or greater than the corresponding threshold**. This requires the contracting authority to calculate the approximate value of the procured contract. The directives specify methods for this calculation, including that it should consider the total amount payable (net of VAT) for a public procurement or the total turnover of the concessionaire generated over the duration of the contract (net of VAT) for a concession.⁵⁶

The applicable thresholds pursuant to the EU Directives are presented in table 4 below.

⁵² Art. 2 (8) PP Directive.

⁵³ Annex II PP Directive and Annex I Concessions Directive, listed under the subject “Other building installation”.

⁵⁴ See below under “Thresholds for mixed contracts”.

⁵⁵ The thresholds set by the PP and Concessions directive have been modified in 2017 by the Commission Delegated Regulation (EU) 2017/2365 of 18 December 2017 amending Directive 2014/24/EU of the European Parliament and of the Council in respect of the application thresholds for the procedures for the award of contracts, *OJ L 337, 19.12.2017, p. 19-20*, and by the Commission Delegated Regulation (EU) 2017/2366 of 18 December 2017 amending Directive 2014/23/EU of the European Parliament and of the Council in respect of the application thresholds for the procedures for the award of contracts *OJ L 337, 19.12.2017, p. 21-21*.

⁵⁶ See for further details Art. 5 PP Directive and Art. 8 Concessions Directive.



Contract type	Public procurement	Concessions
Works	5,548	5,548
Supply of services to central authorities ⁵⁷	144	5,548
Supply of services to sub-central authorities	221	
Supply of goods to central authorities	144	-
Supply of goods to sub-central authorities	221	

Table 4. Procurement thresholds (in thousands of euros) according to EU directives.

Source: Authors' own elaboration.

Some contracts combine works, supply of services, and/or supply of goods (“mixed contracts”), which complicates the procedure for determining the applicable procurement threshold.

Thresholds for mixed contracts

The determination of the relevant threshold will depend on the nature and object of the contract and on whether these elements are **objectively separable**.⁵⁸ The directives provide no method for determining objective separability and refer only to EU case law, recommending an examination on a case-by-case basis in which the “*expressed or presumed intentions of the contracting authority to regard the various aspects making up a mixed contract as indivisible should not be sufficient, but should be supported by objective evidence capable of justifying them and of establishing the need to conclude a single contract*”.⁵⁹

1) If the different objects of the contract are objectively separable

If the elements of the contract can be separated, the contracting authority may choose to award separate contracts for individual parts or a single contract for all parts.⁶⁰ For separate awards, the usual procedure applies. In a single contract, the contracting authority can consider either which object is the most essential to meet its needs or which object has the highest value. The Commission provides the following guidance:

⁵⁷ An exhaustive list of central authorities is provided by the PP Directive in its Annex I.

⁵⁸ Art. 3 PP Directive.

⁵⁹ Recital 11 PP Directive.

⁶⁰ Art. 3 par. 4 PP Directive.



Situations	Criteria to determine the type of contract
Works + Supplies	Main subject of contract
Works + Services	Main subject of contract
Services + Supplies	Highest value
Services + Services under the light regime	Highest value

Figure 6. Criteria to determine the contract type in mixed contracts.

Source: European Commission (2018).⁶¹

2) If the different objects of the contract are not objectively separable

In this case, only one contract can be awarded in a single procedure. The applicable legal regime is based on the main contract subject-matter,⁶² to which the above criteria for single contracts apply.

3) If the different objects of the contract fall under different directives

In the case of contracts containing elements of public procurements and concessions, the thresholds from the PP Directive apply, provided that the value of the elements of public procurements is equal to or greater than the relevant threshold in the PP Directive.⁶³

If the value of the contract falls below the thresholds specified in the EU directives, it does not necessarily mean that no tendering process is required. As previously mentioned, some Member States have set stricter standards for the procurement of public contracts.

5.4 Content of the tender

5.4.1 Description of the contract subject-matter

In the tender documentation, the description of the contract subject-matter must be precise. Possible contractual services include the design and implementation of a dynamic lighting concept or, in an even earlier project phase, a municipal needs assessment; the latter was conducted as part of a pilot project in the municipality of Cesena (Italy).⁶⁴ Another important aspect for the contracting authority to bear in mind is the need to perform maintenance on the new infrastructure after it is commissioned. If technical or human resources are lacking, an additional contract must be issued for a maintenance service provider.

Under a typical contract, the external partner only implements an innovation concept and upgrades the infrastructure on behalf of the contracting authority. Other conceivable contract models might combine the implementation of an investment project and the operation of the lighting infrastructure. For example, a

⁶¹ European Commission (2018), *Public procurement guidance for practitioners on avoiding the most common errors in projects funded by the European Structural and Investment Funds*, available at https://ec.europa.eu/regional_policy/sources/docgener/guides/public_procurement/2018/guidance_public_procurement_2018_en.pdf (accessed 17 December 2018).

⁶² Art. 3 par. 6 PP Directive.

⁶³ Art. 3 par. 4 PP Directive.

⁶⁴ For further information, see the Pilot Action 'Green areas lit on a human scale' from the Municipality of Cesena, available at <https://www.interreg-central.eu/Content.Node/Dynamic-Light/Pilot-action-description-CESENA-1.pdf>.



municipality can tender a contracting model in which the external partner assumes all operational management of the lighting infrastructure, including maintenance, investments in upgrades, and electricity provision. In other types of public-private partnerships, the external partner may first upgrade the infrastructure in an investment phase lasting several years and then begin to operate it, with the municipality paying the contracting party only after the upgraded infrastructure is commissioned.⁶⁵

Example case: Dynamic Light pilot actions in Slovenia⁶⁶

In order to implement a pilot action in Slovenia within the Dynamic Light project, three different tenders were initiated:

1. First, to contract an expert for the conception and design of the project, with the aim of preparing a list of the works and services to be contracted;
2. Second, to contract legal support for performance of the subsequent tendering procedure;
3. Third, to tender external partners to implement the project by installing equipment in three different municipalities. (This third tender was divided into three lots.)

The contract subject-matter must be described clearly to potential tenderers. The **common procurement vocabulary (CPV)**⁶⁷ provides a detailed description of the possible subject-matter of a contract.⁶⁸ All subjects listed in the vocabulary are associated with an alphanumeric code for easier identification. Any tender valued above the thresholds in the directives must refer to this classification system when describing the subject of the procured contract.⁶⁹ Common codes related to the development of lighting projects include 45316110-9 for the **installation of street lighting equipment**, 50232100-1 for **maintenance services of street lighting equipment**, 50232200-2 for **maintenance services of signaling equipment**, 50232110-4 for the **commissioning of public lighting installations**, and 65320000-2 for the **management of electrical installations**.

5.4.2 Technical specifications

Qualitative technical specifications are an essential part of tendering documentation, as they allow the contracting authority to describe its needs accurately and enable tenderers to provide satisfactory offers. Contracting authorities may use various methods to draw up technical specifications.⁷⁰

Input-based specifications: The contracting authority may provide a series of detailed instructions on the practical implementation of tendered services. This method is not recommended for tendering a dynamic lighting project, as it leaves tenderers no room to propose their own innovative solutions and transfers to the contracting authority the full burden of project design and planning.

⁶⁵ Dr. Roman Ringwald, Meike Weichel, in: Ringwald, Rönitzsch, Riedel, Praxishandbuch öffentliche Beleuchtung - Wirtschaftlichkeit, Recht, Technik, Beuth, 2013, pp. 96-99.

⁶⁶ For further information about the pilot actions implemented within the Dynamic Light Project, see: <https://www.interreg-central.eu/Content.Node/Dynamic-Light/Pilot-Actions.html>.

⁶⁷ Regulation (EC) No 2195/2002 of the European Parliament and of the Council of 5 November 2002 on the Common Procurement Vocabulary (CPV), *OJ L 340*, 16.12.2002, p. 1.

⁶⁸ European Commission, "Common procurement vocabulary", https://ec.europa.eu/growth/single-market/public-procurement/rules-implementation/common-vocabulary_en (accessed 17 December 2018).

⁶⁹ Art. 23 PP Directive; art. 27 Concessions Directive.

⁷⁰SPP Regions (Sustainable Public Procurement Regions) (2017), *Performance/Output Based Specifications, Best Practice Report*, available at:

http://www.sppregions.eu/fileadmin/user_upload/Resources/POBS_Best_Practice_Report.pdf (accessed 14 January 2019).



Output-based specifications: These specifications shift the focus from the technical details of implementation to the desired project outputs. This allows tenderers to contribute added value to the process through innovation and solutions that the contracting authority may not have taken into account.

Outcome-based specifications: Outcome-based specifications are usually structured as a detailed description of the needs to be met and the expected benefits of the contract. Although such specifications are the easiest to draft, they are the hardest to evaluate and monitor.

The latter two approaches are advisable due to their flexibility and openness to innovative inputs. Specifications based on outputs or outcomes allow for the submission of variant bids. An economic operator may propose **different approaches and alternative solutions** to address the same needs. In drafting the tender criteria, the contracting authority must take care to avoid listing requirements that would preclude possible variants or alternative solutions. However, the more “creative space” is left to the tenderers to design and shape the project, the more difficult it will be to evaluate applications.

5.4.3 Relevant criteria for dynamic lighting solutions

Tendering criteria are the backbone of any tender. They serve as the “filters” to evaluate the quality of the submitted offers. In determining tender criteria, the contracting authority establishes what characteristics it expects the future project to have and what conditions the tenderer must fulfil. The publication of criteria in the tender notice allows tenderers to tailor their offers to what is sought by the public authority. Moreover, it ensures **fairness and transparency** in the selection of the winning offer.

The practice of **Green Public Procurement (GPP)** is particularly relevant to dynamic lighting procurement. As elaborated by the EC, GPP is a process whereby public authorities “*seek to purchase goods, services and works with a reduced environmental impact throughout their life-cycle compared to goods, services and works with the same primary function which would otherwise be procured*”.⁷¹ In order to achieve this goal, GPP criteria may be directly included in the tender documentation.⁷²

The EC has provided stakeholders with guidance in this respect by publishing criteria for 20 different products groups, including the **Criteria for Street Lighting & Traffic Signals**.⁷³ These include criteria on the equipment, design, and installation of street lighting infrastructure. The luminaire efficacy (expressed as lm/W), dimming control compatibility, annual energy consumption indicator (AECI), and ratio of upward light output (RULO) are among the listed criteria. GPP criteria may also be issued by Member States, as is the case in Italy, for example.⁷⁴

Furthermore, European standards and labels on lighting products and equipment also provide a reliable and measurable way to verify compliance with minimum requirements. These may be used as technical criteria in tendering procedures. The Commission regularly updates a list of European and international eco-labels.⁷⁵

⁷¹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Public procurement for a better environment {SEC(2008) 2124} {SEC(2008) 2125} {SEC(2008) 2126} /* COM/2008/0400 final */.

⁷² See section 6.5 “Awarding procedure: weighing criteria to assess the offers”.

⁷³ Commission staff working document - EU green public procurement criteria for road lighting and traffic signals, SWD(2018) 494 final, available at: http://ec.europa.eu/environment/gpp/pdf/toolkit/181210_EU_GPP_criteria_road_lighting.pdf (accessed 11 January 2019).

⁷⁴ Ministerial decree of 27 September 2017, GU Serie Generale n.244 del 18-10-2017 - Suppl. Ordinario n. 49 and ministerial decree of 28 April 2018, GU Serie Generale n.98, 28-04-2018.

⁷⁵ European Commission, DG ENV, List of existing EU and international eco-labels, available at <http://ec.europa.eu/environment/gpp/pdf/ecolabels.pdf> (accessed 11 January 2019).



Therefore, a wide variety of dynamic lighting solutions may be implemented in municipalities depending on their needs. In the tender, criteria for technical standards should be tailored to the municipality's planned intervention on a **case-by-case basis**.

Example case: Dynamic Light pilot action in Cesena (Italy)

In a pilot installation seeking to improve pedestrian lighting design within public parks in the city of Cesena, several issues and relevant technical standards were considered. One key constraint was the need for dynamic lighting to comply with regulations on lighting pollution.

In the Emilia Romagna Region, the law on light pollution⁷⁶ addresses a broad range of pollution-related effects, in particular by controlling the emission of light above the horizontal and limiting LED sources with correlated colour temperature (CCT) above 4000K. The main provisions permit:

- a maximum emission of 0.49 cd/klm (candela per kilolumen) above 90° (or 2250 lm above 90° for lighting installation made by 1500 lm flux or below);
- CCT below 4000K.

This regulation contrasts with the Italian GPP scheme for limiting light pollution, because it has a near-zero relative limitation for every area. However, in such cases, a luminaire's throw angle would not be high enough to provide good vertical illuminance.

In this context, a dynamic lighting solution could both improve pedestrian lighting design and comply with both Emilia Romagna law and Italian GPP criteria. Because the dynamic luminaire will remain at maximum power roughly 5% of its daily use, the total minimum power needed to achieve 0.49 cd/klm is:

- $X \text{ cd/klm} * 95\% \text{ time} + 1.90 \text{ cd/klm} * 5\% \text{ time} = 0.49 \text{ cd/klm}$
- $X = 0.42 \text{ cd/klm}$, i.e. $0.42/1.90 = 22\% \text{ power}$.⁷⁷

5.5 Awarding procedure: using criteria to assess the offers

The offers are evaluated according to three types of criteria:

- **Exclusion grounds:** grounds leading to the elimination of an economic operator from the procedure;
- **Selection criteria:** minimum criteria for assessing the suitability of an offer, mostly concerning the ability of tenderers to perform the contract properly; and
- **Awarding criteria:** criteria for weighing the quality of an offer to determine the most economically advantageous tender.

5.5.1 Exclusion grounds

Under the directives,⁷⁸ an economic operator must be excluded from participating in a tender procedure if it is associated with any of the following:

- participation in a criminal organisation,
- corruption,
- fraud,

⁷⁶ Law n. 19/2003 published on BUR n.147/2003.

⁷⁷ For further technical details, see: 'Deliverable D.T3.1.3 - Analysis of the specific lighting situation - CESENA'.

⁷⁸ Art. 57 PP Directive; Art. 38 Concessions Directive.



- terrorist offences or offences linked to terrorist activities,
- money laundering or terrorist financing, or
- child labour and other forms of human trafficking.

In addition, national law may establish other grounds for exclusion, as in the case of non-compliance with environmental, social, or labour law; bankruptcy; professional misconduct; distortion of competition; or a conflict of interest.

5.5.2 Selection criteria

Selection criteria are used to identify tenderers who are qualified for the contract on the basis of their **professional suitability**, their **economic and financial capacity** and **technical ability**. The **number of years of experience in the relevant field** and **number of similar projects already performed** can be a suitable parameter for assessing the professional competence of the tenderers.

Permitted selection criteria

Selection criteria must be “*related and proportionate to the subject-matter of the contract*”.⁷⁹ For example, it would be unreasonable to require tenderers to report a minimum yearly turnover which is disproportionately high relative to the estimated value of the contract.

Moreover, the selection criteria must comply with the European principles of **fairness in competition** and **non-discrimination**. Reference to particular technological or professional standards is permitted. However, a contracting authority must always complement these references with the wording “or equivalent” to avert the risk of discriminatory criteria.

The European legislature has attempted to reduce the administrative burden for tenderers. Contracting authorities must accept a self-declaration, the **European Single Procurement Document (ESPD)**, from the tenderers as preliminary evidence that they are in compliance with criteria for exclusion and selection.⁸⁰ The ESPD is provided in electronic form and is submitted in lieu of other documentation and certificates required during the tendering phase.⁸¹ These documents must be presented only by the winner of the tender. The EC has provided a tool to assist procurement practitioners in creating an ESPD.⁸² The single e-procurement platform present at national or local level is also intended to include a tool for developing the ESPD.

Selection criteria can also concern the object of the contract by **defining minimum technical criteria that an offer must meet before it can be considered**. When soliciting tenders for a new energy-efficient lighting system, for example, the municipality of Cascais (Portugal) set as a selection criterion the use of recognised environmental management systems (EMAS), such as an engineered materials arresting system, ISO 14001, or equivalent measures.⁸³

⁷⁹ Art. 58 par. 1 PP Directive and recital 63 Concessions Directive.

⁸⁰ Art. 59 PP Directive.

⁸¹ European Commission (2017), DG GROW, European Single Procurement Document and e-Certis, available at: <http://ec.europa.eu/growth/single-market/public-procurement/e-procurement/espdl/> (accessed 9 January 2019).

⁸² European Commission (2017), ESPD, available at: <https://ec.europa.eu/tools/espdl/> (accessed 9 January 2019).

⁸³ European Commission, “GPP in practice - Purchasing energy-efficient outdoor lighting in Cascais”, http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue7_Example18_Cascais_Lighting.pdf (accessed 10 January 2019).



5.5.3 Award criteria

Once eligible tenderers are selected, the contracting authority ranks the offers in accordance with relevant criteria. The contract is awarded to the **most economically advantageous tender (MEAT)**.⁸⁴ This prevents contracting authorities from basing their procurement decision on non-economic criteria alone. The cost aspects can be weighed as part of the offer assessment or specified in advance by the contracting authority, which then evaluates the best offers at this fixed price. In fixed-price tenders, bids are evaluated based on the quality of the proposed works, services, or products. The MEAT can be selected through various evaluation methods, as described below.

Cost-effectiveness approach/life-cycle costing: The tenders are evaluated in terms of the total cost. Life-cycle costing (LCC) means that tender evaluations consider all costs of the works, goods, or services procured throughout the tender life-cycle. The purchase price is only one of the parameters taken into account. LCC calculation tools have been developed by several European and national bodies in recent years.⁸⁵

Best price-quality ratio: This approach considers both economic and qualitative criteria, with the winning tender offering the best value for money (VfM). Qualitative criteria must be related to the subject-matter of the tendered contract and may include sub-criteria, such as technical merit, environmental and innovative conditions, and functional characteristics. This approach is suitable in cases where a simple cost assessment is not sufficient to evaluate the tenders. For contracts related to the design of works and the installation and/or maintenance of specialised products and services, the quality of purchased services can be particularly important. In these cases, it is appropriate to weigh elements other than costs when assessing tenders. This approach is therefore advisable when drafting the awarding criteria for a dynamic lighting project. The tender is evaluated by **assigning each criterion and sub-criterion a specific weight**, expressed as either a percentage or a quantifiable score. The specific criteria and their respective weights must be specified by the contracting authorities when the tender is drafted, and then must be clearly indicated in the tender documents. Table 5 below lists examples of the criteria that may be used.⁸⁶

Criteria	Sub-criteria
Costs	Investment costs
	Life-cycle costs
Quality	Technical merit, e.g. lighting technology, light colour, light temperature
	Functionality, e.g. distance of pillars, adaptive technology
	Social, environmental, and innovative aspects
	Design/aesthetic characteristic
Performance of other services	Delivery conditions
	Maintenance
	Technical assistance

⁸⁴ Art. 67 PP Directive.

⁸⁵ See for example: <http://www.smart-spp.eu/index.php?id=6988>, <https://www.upphandlingsmyndigheten.se/en/subject-areas/lcc-tools/> (including a specific tool for outdoor lighting procurement), http://ec.europa.eu/environment/gpp/pdf/09_06_2015/Life_cycle_costing_calculation_tool.pdf.

⁸⁶ Concrete technical aspects and values for LED street lighting can be found under: Premium Light Pro (2017), *Procurement criteria for LED Street Lighting*, available at: http://www.premiumlightpro.eu/fileadmin/user_upload/Guidelines/Procurement_Criteria_Outdoor.pdf (accessed 11 January 2019).



Table 5. Examples of best price-quality ratio award criteria for tendering dynamic lighting projects.

Source: Authors' own elaboration based on Art. 67 PP Directive and EU GPP Criteria for Street Lighting & Traffic Signals.

The criteria are directly related to the specific subject-matter of the contract and must be determined on a case-by-case basis. GPP criteria, such as those provided by the EC, may be used for dynamic lighting projects.



6. Conclusion

This document is intended for use by public actors and developers interested in introducing dynamic lighting solutions into public lighting infrastructure. It provides guidance on the project process by outlining the steps from project design through implementation, including the procedures for development, financing, and procurement. This guideline demonstrates the interrelationship between theory and practice: it is based on a careful review of relevant regulatory frameworks at European and national levels as well as on empirical information drawn from project deliverables and discussions with internal and external experts.

The participation of project partners was fundamental to the elaboration of this guideline. In particular, the partners provided 1) policy and legal information from each partner country and 2) detailed reports on the pilot actions implemented in each city. These valuable contributions will facilitate knowledge sharing with other Central and Eastern European municipalities seeking to implement dynamic lighting solutions.

The pilot actions are expected to reduce energy consumption and CO₂ emissions in the future. A precise assessment of the costs and benefits of dynamic lighting solutions will be possible only over the longer term, as more statistical information becomes available. However, the figures and scenarios produced from the pilot actions already point to a promising outlook for the project's effectiveness in lowering energy consumption and CO₂ emissions. Through a knowledge transfer between municipalities, such information will likely lead to future adaptations of dynamic lighting solutions that are broader than was possible within the scope of this project.

To enable the implementation of dynamic public lighting in municipalities, this guidance presents funding opportunities identified within the project. The most relevant are 1) European funding sources, such as the European Structural and Investment Funds (ESIF), European Regional Development Fund (ERDF), and Cohesion Fund (CF); 2) national funding sources, which are available to each Member State that operates and co-finances multiple supporting programmes based on ESIF funding; 3) financial intermediaries, which play a crucial role in providing finance for energy-efficiency investments; and 4) the private sector, which plays an active role in the energy sector and could therefore finance or co-finance the implementation of a dynamic lighting solution.

Municipalities with a shortage of human resources may need to seek external support for project implementation and tender a service contract. Project partners who tendered pilot actions contracted an external entity to implement a dynamic lighting concept and upgrade the lighting infrastructure on the municipality's behalf. Other conceivable contract models might combine project implementation and operation of the lighting infrastructure.

Depending on project design, contracts can be tendered as a public procurement or concessions. These two contract types are mutually exclusive. Three types of objects of contracts are relevant for implementing dynamic lighting solutions within EU public procurement directives: works, supply of services, and supply of goods. "Mixed contracts", which combine the objects of the contracts, may increase the complexity involved in determining the applicable threshold for procurement. This threshold is also conditional on the object of the contract. Moreover, depending on the value of the contract, national or EU procedure rules may apply. Municipalities should review in detail which rules apply in each case. This guideline emphasises the need for municipalities to seek expert advice at all project stages. This includes seeking legal advice to ensure that procurement procedures and project implementation are carried out in compliance with the requirements of EU and national law.



Useful links

Procurement documents and tools

Public procurement: https://ec.europa.eu/growth/single-market/public-procurement_en

Tendering rules and procedures: https://europa.eu/youreurope/business/selling-in-eu/public-contracts/rules-procedures/index_en.htm

Common procurement vocabulary: https://ec.europa.eu/growth/single-market/public-procurement/rules-implementation/common-vocabulary_en

European Single Procurement Document: <https://ec.europa.eu/tools/espd>

SIMAP: <http://simap.ted.europa.eu/home> **SIMAP** home page: <http://simap.ted.europa.eu/home>

Standard forms for public procurement: <http://simap.ted.europa.eu/en/web/simap/standard-forms-for-public-procurement>

Tenders Electronic Daily: <https://ted.europa.eu/TED/main/HomePage.do> **Tenders Electronic Daily (TED):** <https://ted.europa.eu/TED/main/HomePage.do>

Public procurement guidance:

https://ec.europa.eu/regional_policy/sources/docgener/guides/public_procurement/2018/guidance_public_procurement_2018_en.pdf

Guidelines on (green) public procurement

EU Green Public Procurement criteria for road lighting and traffic signals:

http://ec.europa.eu/environment/gpp/pdf/toolkit/181210_EU_GPP_criteria_road_lighting.pdf

Lighting standards and labels: https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/energy-efficient-products/lighting_en

List of existing EU and international eco-labels:

<http://ec.europa.eu/environment/gpp/pdf/ecolabels.pdf>

Procurement criteria for LED Street lighting:

http://www.premiumlightpro.eu/fileadmin/user_upload/Guidelines/Procurement_Criteria_Outdoor.pdf

GPP Good Practice: http://ec.europa.eu/environment/gpp/case_group_en.htm

Handbook on Green Public Procurement: <http://ec.europa.eu/environment/gpp/pdf/Buying-Green-Handbook-3rd-Edition.pdf>

Funding guidelines and tools

Guideline on financing model for public lighting investment: <http://www.interreg-central.eu/Content.Node/Dynamic-Light/CE452Dynamic-Light-D.T2.3.3-Best-Practice-Guide-final.pdf>

List of relevant EU funding: https://europa.eu/european-union/about-eu/funding-grants_en



Life-cycle cost calculation tools

Tool for calculating life-cycle cost (LLC) and CO₂ emissions: http://www.smart-spp.eu/fileadmin/template/projects/smart_spp/files/Guidance/Final_versions/EN_SMART_SPP_Tool_User_Guide_2011_FINAL.pdf

LCC tools (including a specific tool for outdoor lighting procurement):
<https://www.upphandlingsmyndigheten.se/en/subject-areas/lcc-tools/>

LCC calculation tool:
http://ec.europa.eu/environment/gpp/pdf/09_06_2015/Life_cycle_costing_calculation_tool.pdf

Research projects

Dynamic Light: <https://www.interreg-central.eu/Content.Node/Dynamic-Light.html>

Premium Light Pro: <http://www.premiumlightpro.eu/>

Smart SPP: <http://www.smart-spp.eu/index.php?id=6988>



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Novikova, A., Stelmakh, K., Emmrich, J., Stamo, I., and Hessling, M. (2017), *Guidelines on finding a suitable financing model for public lighting investment: Deliverable D.T2.3.4*. Report of the EU funded project “INTERREG Central Europe CE452 Dynamic Light”, July 2017, available at: <http://www.interreg-central.eu/Content.Node/Dynamic-Light/CE452Dynamic-Light-D-T2.3.4-Guidelines-on-finding-a-suitable.pdf> (accessed 14 January 2019)

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